IN THE CLAIMS

We claim:

1. An apparatus for wet processing individual wafers, comprising:

means for holding the wafer;

means for providing acoustic energy to a non-device side of the wafer; and

means for flowing a fluid onto a device side of the wafer.

2. The apparatus for wet processing individual wafers of claim 1, wherein the sonic energy strikes the wafer non-device side perpendicular.

3. The apparatus for wet processing individual wafers of claim 1, further comprising:

means for mounting one or more acoustic wave transducers; and

means for positioning the one or more acoustic wave transducers to be parallel to and facing the non-device side of the wafer.

4. The apparatus for wet processing individual wafers of claim 1, further comprising:

means for flowing a liquid between the one or more acoustic wave transducers and the non-device side of the wafer.

5. The apparatus for wet processing individual wafers of claim 1, wherein means for providing acoustic energy to a non-device side of the wafer is carried out by a platter having a front side and a back side; and the one or more acoustic wave transducers are mounted on the platter backside.

6. The apparatus for wet processing individual wafers of claim 1, further comprising:

a device for rotating the wafer.

7. The apparatus for wet processing individual wafers of claim 1, further comprising:

a device for linearly transporting the wafer.

8. The apparatus for wet processing individual wafers of claim 1, wherein means for flowing a liquid onto the device side of a wafer is a nozzle positioned to direct a flow onto the device side of the wafer.

9. The apparatus for wet processing individual wafers of claim 3, wherein the one or more acoustic wave transducers are a piezoelectric material.

10. The apparatus for wet processing individual wafers of claim 5, wherein the platter is positioned parallel to the wafer surface, with the platter front side facing the wafer non-device side.

11. The apparatus for wet processing individual wafers of claim 10, wherein the platter diameter is at least 95% the diameter of the wafer.

12. The apparatus for wet processing individual wafers of claim 11, wherein the one or more acoustic wave transducers are mounted on the platter backside to cover 50-100% of the platter backside area.

13. The apparatus for wet processing individual wafers of claim 3, wherein the one or more acoustic wave transducers cover the radius of a wafer.

14. The apparatus for wet processing individual wafers of claim 3, wherein the one or more acoustic wave transducers cover the diameter of a wafer.

15. The apparatus for wet processing individual wafers of claim 3, wherein the one or more acoustic wave transducers provide acoustic energy to cover 50-100% of the non-device side of the wafer.

16. The apparatus for wet processing individual wafers of claim 1, wherein means for providing the one or more acoustic wave transducers to the non-device side of the wafer is constructed such as to have a resonance frequency of 5.4 MHz ± 30% for 300 mm wafers.

17. The apparatus for wet processing individual wafers of claim 1, wherein means for providing the one or more acoustic wave transducers to the non-device of the wafer is constructed such as to have a resonance frequency of 4215 m/d ± 30%, with d = thickness of the wafer in m.

18. The apparatus for wet processing individual wafers of claim 1, wherein means for providing the one or more acoustic wave transducers to a non-device side of the wafer is constructed such as to have a resonance frequency less than 1.5 MHz.

19. The apparatus for wet processing individual wafers of claim 1, wherein the provided acoustic energy is pulsed.

20. The apparatus for wet processing individual wafers of claim 5, wherein the platter thickness is one fourth the one or more acoustic wave transducers sonic wavelength ($\lambda/4$)± 30%.

21. The apparatus for wet processing individual wafers of claim 5, wherein the platter thickness is one half the one or more acoustic wave transducers sonic wavelength ($\lambda/2$)± 30%.

22. The apparatus for wet processing individual wafers of claim 5, further comprising a through hole in the platter for flowing a liquid.

23. The apparatus for wet processing individual wafers of claim 22, further comprising a fluid feed tube attached to the through hole at the platter backside.

24. The apparatus for wet processing individual wafers of claim 5, wherein a coating is applied to the platter front side.

25. The apparatus for wet processing individual wafers of claim 24, wherein the coating is a fluoropolymer.

26. A method of processing individual wafers, comprising:

transmitting sonic energy to the wafer non-device side; while flowing a liquid onto the wafer device side.

27. The method of processing individual wafers of claim 26, further comprising:

flowing a liquid on the non-device side of the wafer, through which the sonic energy is transmitted to the non-device side.

28. The method of processing individual wafers of claim 26, wherein the first fluid is a thin film.

29. The method of processing individual wafers of claim 26, further comprising:

applying megasonic energy to the wafer in the range between 500 kHz – 8MHz.

30. The method of processing individual wafers of claim 26, further comprising:

applying megasonic energy to the wafer at 5.4 MHz ± 30%.

31. The method of processing individual wafers of claim 29, further comprising:

applying megasonic energy to the wafer at a frequency of 4215 m/d ± 30%, with d = thickness of the wafer in m.

32. The method of processing individual wafers of claim 29, further comprising:

applying megasonic energy to the wafer at a frequency less than 1.5 MHz.

33. The method of processing individual wafers of claim 29, further comprising:

applying the megasonic energy in a pulsed mode.

34. The method of processing individual wafers of claim 27, wherein the second fluid between the wafer and the platter is a degasified liquid.

35. The method of processing individual wafers of claim 26, wherein flowing onto the wafer device side is a liquid containing a dissolved gas from the group of H_2, O_2, N_2, Ar, or He.

36. The method of processing individual wafers of claim 26, wherein the wet processing of individual wafers is a cleanup process to remove contaminants from the wafer device side and non-device side.

37. The method of processing individual wafers of claim 26, wherein the wet processing of individual wafers is a rinsing process.

38. The method of processing individual wafers of claim 26, further comprising rotating the wafer.

39. The method of processing individual wafers of claim 38, further comprising:

rotating the wafer at an rpm between 10-6000.

40. The method of processing individual wafers of claim 26, wherein the acoustic energy covers the wafer non-device side between 50-100%.

41. The method of processing individual wafers of claim 26, wherein the acoustic energy covers the wafer non-device side in a linear fashion along the radius of the wafer.

42. The method of processing individual wafers of claim 26, wherein the acoustic energy covers the wafer non-device side in a linear fashion covering the diameter of the wafer.

43. The method of processing individual wafers of claim 26, wherein the wafer is held with the non-device side facing the platter front side and where the sonic

energy is transmitted from the one or more acoustic wave transducers on the platter backside.

44. The method of processing individual wafers of claim 43, wherein the wafer non-device side is held substantially parallel to the platter.

45. An apparatus for wet processing individual wafers, comprising:

a platter having a front side and a backside, comprising:

a coating on the platter front side,

a greater diameter than the wafer to be processed,

a fluid feed port at a pivot point of the platter,

a plurality of megasonic piezoelectric transducers on the backside of the platter, such that the transducers cover greater than 80% of the platter area;

a wafer bracket capable of rotation up to 6000 rpm while positioning a non-device side of the wafer substantially parallel to and centered over the platter front side; and

a nozzle capable of directing a fluid flow toward a device side of the wafer.

46. The apparatus for wet processing individual wafers of claim 1, wherein the plurality of transducer areas provide between 90-100% coverage of the wafer non-device side.

47. The apparatus for wet processing individual wafers of claim 30, wherein 5.4 MHz is applied to the wafer device side.

48. The apparatus for wet processing individual wafers of claim 30, wherein

5.4 MHz is applied to the wafer non-device side.

49. The method of processing individual wafers of claim 31, further comprising: applying the megasonic energy to the wafer device side.

50. The method of processing individual wafers of claim 31, further comprising: applying the megasonic energy to the wafer non-device side.

51. An apparatus for sequencing wet processing of individual wafers, comprising:

a plurality of single wafer process chambers each comprising:

a plurality of transducers positioned to transmit sonic energy to a non-device side of the wafer,

a plurality of wafer cartridges; and

a centrally located robot arm able to take wafers to and from the wafer process chambers and to and from the wafer cartridges.

52. The apparatus of claim 1, further comprising:

means for providing an efficiency of at least 30% of the power applied to the transducers reaches the wafer.

53. The apparatus of claim 1, wherein the acoustic energy is provided by acoustic wave transducers that generate a frequency = (velocity of sound in a wafer material) / (2) (a thickness of the wafer).

54. The apparatus of claim 1, further comprising:

means for mounting one or more acoustic wave transducers; and

means for positioning the one or more acoustic wave transducers to be parallel to and facing a non-device side of the wafer.

55. The apparatus of claim 54, further comprising:

means for flowing a liquid between the one or more acoustic wave transducers and the non-device side of the wafer.

56. The apparatus of claim 55 further comprising:

means for positioning the one or acoustic wave transducers onto a platter to provide 80% or greater acoustic coverage on the platter.

57. An apparatus for processing a wafer, comprising:

a bracket for positioning and rotating the wafer about an axis;

a platter aligned beneath and parallel to the bracket, with the platter having a through hole; and

a fluid source connected to the through hole for flowing a first chemical within a gap between the wafer and the platter.

58. The apparatus of claim 57, further comprising one or more nozzles positioned over the top of the wafer.

59. The apparatus of claim 58, further comprising a source for a second chemical attached to at least one of the one or more nozzles.

60. The apparatus of claim 58, further comprising a source for a gas attached to at least one of the one or more nozzles.

61. The apparatus of claim 57, further comprising one or more acoustic wave transducers attached to a bottom side of the platter.

62. The apparatus of claim 61, wherein the one or more acoustic wave transducers are capable of generating a single frequency.

63. The apparatus of claim 62, wherein the single frequency is approximately 5.4 ± 30% MHz.

64. The apparatus of claim 62, wherein the single frequency is greater than approximately 400 kHz.

65. The apparatus of claim 62, wherein the single frequency is in the range of approximately 1.5 – 1.8 MHz.

66. The apparatus of claim 57, further comprising a plurality of acoustic wave transducers attached to the bottom side of the platter capable of generating a plurality of frequencies.

67. The apparatus of claim 66, wherein one of the plurality of frequencies is approximately 5.4 ± 30% MHz.

68. The apparatus of claim 66, wherein the plurality of frequencies are greater than approximately 400 kHz.

69. The apparatus of claim 66, wherein at least one of the plurality of frequencies is in the range of approximately 1.5 – 1.8 MHz.

70. The apparatus of claim 66, wherein at least one of the plurality of frequencies is approximately 900 kHz and at least one other of the plurality of frequencies is approximately 1.8 MHz.

71. The apparatus of claim 66, wherein at least one of the plurality of frequencies is a transparent frequency.

72. The apparatus of claim 66, wherein at least one of the plurality of frequencies = (velocity of sound in a wafer material)/(2)(a thickness of the wafer).

73. The apparatus of claim 59, wherein at least one of the one or more nozzles are capable of adding acoustic energy to the second chemical.

74. The apparatus of claim 73, wherein the acoustic energy applied to the second chemical is a single frequency.

75. The apparatus of claim 73, wherein the acoustic energy applied to the second chemical is a plurality of megasonic frequencies.

76. The apparatus of claim 57, wherein at least two nozzles are positioned above the wafer and the second chemical contains a single megasonic frequency in each nozzle and the single megasonic frequency at one nozzle is different from at least one other nozzle.

77. The apparatus of claim 76, wherein the plurality of megasonic frequencies is applied to the second chemical in at least one of the one or more nozzles.

78. The apparatus of claim 76, wherein one of the single megasonic frequencies is 5.4 ± 30% MHz.

79. The apparatus of claim 76, wherein one of the single megasonic frequencies is approximately 900 kHz and one other of the single megasonic frequencies is approximately 1.8 MHz.

80. The apparatus of claim 57, wherein the platter has a dished-out center.

81. The apparatus of claim 80, wherein the dished-out center is deep enough to submerge approximately one half a total area of the wafer.

82. The apparatus of claim 80, wherein the dished-out center is approximately 3 mm deep.

83. The apparatus of claim 57, wherein the gap is in the range of approximately .001 - .010 mm.

84. The apparatus of claim 57, wherein the gap is approximately .003 mm.

85. The apparatus of claim 57, wherein the bracket is capable of rotating at speeds of up to 10,000 rpm.

86. The apparatus of claim 57, wherein the bracket is capable of translating in the direction of an axis of rotation of the bracket.

87. The apparatus of claim 86, wherein the translation distance is approximately 1 inch.

88. The apparatus of claim 66, wherein at least one of the plurality of frequencies capable of being generated is approximately a whole integer multiple of the lowest frequency.

89. The apparatus of claim 66, wherein at least two of the plurality of acoustic wave transducers capable of transmitting at a first frequency are positioned on two diagonal quadrants of the platter and at least two of the plurality of acoustic wave transducers capable of generating at a second frequency are positioned on the remaining quadrants.

90. The apparatus of claim 66, wherein the plurality of acoustic wave transducers are positioned on the platter in one or more linear strips.

91. The apparatus of claim 66, wherein the plurality of acoustic wave transducers capable of generating the plurality of frequencies are positioned on the platter are uniformly mixed.

92. The apparatus of claim 66, wherein at least one of the plurality of acoustic wave transducers capable of transmitting at a first frequency is positioned on a half of the platter and at least one of the plurality of acoustic wave transducers capable of generating at a second frequency is positioned on a remaining half.

93. The apparatus of claim 57, wherein the bracket is capable of a variable rotation speed.

94. The apparatus of claim 57, wherein the platter is larger than the wafer.

95. The apparatus of claim 57, wherein the platter is circular.

96. The apparatus of claim 95, wherein a center of the through hole is located substantially at a center of the circular platter.

97. The apparatus of claim 95, wherein the center of the through hole is located off-set from the center of the circular platter.

98. The apparatus of claim 59, wherein the second chemical is DI water.

99. The apparatus of claim 60, wherein the gas is N_2.

100. The apparatus of claim 60, wherein the gas is IPA diluted in N_2.

101. The apparatus of claim 57, wherein the first chemical is DI water.

102. The apparatus of claim 57, wherein the platter is capable of translating along the axis of rotation of the bracket.

103. The apparatus of claim 58, wherein at least one of the one or more nozzles can be positioned within 5 mm of the wafer.

104. The apparatus of claim 58, wherein at least one of the one or more nozzles can be positioned within the outer half of a radius of the wafer.

105. An apparatus for processing individual wafers, comprising:

a rotatable wafer holding bracket;

means for flowing a first chemical between the wafer and a platter; and

means for providing acoustic energy to a bottom side of the wafer.

106. The apparatus of claim 105, further comprising:

means for keeping the wafer topside dry.

107. The apparatus of claim 105, further comprising:

means for applying a second chemical to the wafer topside.

108. The apparatus of claim 107, further comprising:

means for applying acoustic energy to the topside of the wafer.

109. An apparatus for processing a wafer, comprising:

a bracket for positioning and rotating the wafer about an axis;

a platter aligned beneath and parallel to the bracket, with the platter having a through hole;

a fluid source connected to the through hole for flowing a first chemical within a gap between the wafer and the platter; and

a plurality of acoustic wave transducers positioned on the platter that are capable of transmitting a plurality of frequencies.

110. The apparatus of claim 109, further comprising one or more nozzles positioned over the top of the wafer.

111. The apparatus of claim 110, wherein at least one of the one or more nozzles is connected to a source of a gas.

112. The apparatus of claim 110, wherein at least one of the one or more nozzles is connected to a source of a second chemical.

113. The apparatus of claim 109, wherein at least one of the plurality of frequencies is a transparent frequency.

114. The apparatus of claim 110, wherein at least one nozzle is capable of imparting acoustic energy to the second chemical flowing through the nozzle.

115. The apparatus of claim 114, wherein the acoustic energy is at a frequency greater than 400 kHz.

116. An apparatus for processing a wafer, comprising:

a bracket for positioning and rotating the wafer about an axis;

a platter aligned beneath and parallel to the bracket, with the platter having a through hole;

a fluid source connected to the through hole for flowing a first chemical within a gap between the wafer and the platter;

a plurality of acoustic wave transducers positioned on the platter that are capable of transmitting a plurality of megasonic frequencies; and

at least one of the plurality of megasonic frequencies is a transparent frequency.

117. The apparatus of claim 116, wherein at least one of the plurality of megasonic frequencies is a whole integer multiple of the lowest frequency.

118. The apparatus of claim 116, wherein at least one of the plurality of megasonic frequencies is approximately 5.4 ± 30% MHz.

119. A method of processing a wafer, comprising:

placing a wafer in a bracket;

positioning the bracket such that, the wafer is separated from and parallel to a platter;

rotating the bracket; and

flowing a first chemical between the platter and a bottom side of the wafer.

120. The method of claim 119, further comprising, flowing a gas onto the wafer top side.

121. The method of claim 119, further comprising, applying megasonic energy to the wafer bottom side.

122. The method of claim 121, further comprising, applying a second chemical to the wafer topside.

123. The method of claim 122, further comprising, applying megasonic energy to the second chemical.

124. The method of claim 122, further comprising positioning the wafer to be device side up in the bracket.

125. The method of claim 124, further comprising applying the megasonic energy at a frequency above 400 kHz.

126. The method of claim 124, further comprising, applying the megasonic energy at a frequency that is a transparent frequency.

127. The method of claim 124, further comprising applying the megasonic energy at a frequency of approximately 5.4 MHz.

128. The method of claim 124, further comprising applying megasonic energy at a plurality of frequencies.

129. The method of claim 128, further comprising applying the megasonic energy at a plurality of frequencies above 400 kHz.

130. The method of claim 128, wherein one of the plurality of frequencies is approximately 5.4 ± 30% MHz.

131. The method of claim 128, wherein at least one of the plurality of frequencies is a multiple of 2 of the lowest frequency.

132. The method of claim 128, wherein one of the plurality of frequencies is approximately 900 kHz and another one of the plurality of frequencies is approximately 1.8 MHz.

133. The method of claim 128, wherein one of the plurality of frequencies is approximately in the range of 1.5 - 1.8 MHz.

134. The method of claim 128, further comprising varying a power level of the megasonic energy during wafer processing.

135. The method of claim 134, wherein varying the power includes varying the power to zero for at least one of the plurality of frequencies.

136. The method of claim 119, wherein a flow rate of the first chemical is varied.

137. The method of claim 122, wherein a flow rate of the second chemical is varied.

138 The method of claim 119, further comprising:

placing the wafer within a dished out area of the platter; and

placing the first chemical between the dished out area and the wafer.

139. The method of claim 128, further comprising:

generating the plurality of frequencies with a plurality of acoustic wave transducers; and

superimposing all of the frequency signals and sending the superimposed signal to the plurality of acoustic wave transducers.

140. A method for processing a wafer, comprising:

placing the wafer device side up in a bracket;

positioning the bracket such that the wafer is substantially parallel to and separated from a platter;

flowing a first chemical between a bottom side of the wafer and the platter;
rotating the wafer;
applying a second chemical to a topside of the wafer;
applying megasonic energy to the wafer non-device side; and
performing a wafer cleaning operation.

141. The method of claim 140, wherein the wafer cleaning operation comprises:
applying the first chemical to coat the wafer;
spinning the wafer at 10 – 50 rpm until the wafer is coated; and
spinning the wafer after coating in the range of approximately 50 – 300 rpm.

142. The method of claim 141, wherein the first chemical is DI water.

143. The method of claim 141, wherein the first chemical is RC-1.

144. The method of claim 141, wherein the after coating rpm is approximately 150.

145. The method of claim 142, wherein the wafer rpm to coat the wafer is approximately 15.

146. The method of claim 141, further comprising:
applying the first chemical to rinse the wafer;
spinning the wafer at up to 1000 rpm.

147. The method of claim 146, further comprising the first chemical for rinsing is DI water.

148. The method of 146, further comprising:

applying a gas; and

spinning the wafer at greater than 1000 rpm to dry the wafer.

149. The method of claim 147, wherein rinse is DI water followed by isopropyl alcohol vapor in nitrogen gas.

150. The method of claim 140, wherein the megasonic energy applied to the non-device side of the wafer contains a plurality of frequencies.

151. The method of claim 150, wherein the plurality of frequencies applied to the non-device side are multiples of 2 of the lowest frequency.

152. The method of claim 150, wherein one of the plurality of frequencies applied to the non-device side is approximately 5.4 ± 30% MHz.

153. The method of claim 150, further comprising applying the megasonic energy at a plurality of frequencies above 400 kHz.

154. The method of claim 150, wherein one of the plurality of frequencies is approximately 5.4 ± 30% MHz.

155. The method of claim 150, wherein at least one of the plurality of frequencies is a multiple of 2 of the lowest frequency.

156. The method of claim 150, wherein one of the plurality of frequencies is approximately 900 kHz and another one of the plurality of frequencies is approximately 1.8 MHz.

157. The method of claim 150, wherein one of the plurality of frequencies is approximately in the range of approximately 1.5 - 1.8 MHz.

158. The method of claim 140, wherein megasonic energy is applied to the second chemical.

159. The method of claim 140, wherein the second chemical is dispensed through one or more nozzles.

160. The method of claim 158, wherein the second chemical is dispensed through a plurality of nozzles and at least one nozzle places a different frequency into the second chemical than at least one other nozzle.

161. The method of claim 140, wherein the first chemical is more dilute than the second chemical.

162. The method of claim 148, wherein the first chemical and the second chemical are discarded.

163. A method for processing a wafer, comprising:

positioning a wafer onto a bracket;

rotating the bracket at a first speed to dispense a first chemical onto a non-device side and to dispense a second chemical onto a device side of the wafer;

rotating the bracket at a speed slower than the first speed once dispensed;

applying megasonic energy to the wafer non-device side;

rotating the bracket at a speed higher than the first speed to rinse the wafer; and

rotating the bracket at a speed higher than the first speed to dry the wafer.

164. The method of claim 163, wherein the platter is lowered relative to the wafer during the wafer drying operation.

165. The method of claim 163, wherein the first chemical is more dilute than the second chemical.

166. The method of claim 163, wherein the first chemical and the second chemical are discarded after one use.

167. A method for cleaning wafers, comprising:

providing a wafer having poly-silicon or amorphous structures smaller than 0.3 micron on a device side of the wafer;

exposing the device side to a first chemical;

positioning a set of acoustic wave transducers to be parallel to a wafer non-device side; and

impinging the wafer non-device side normally with megasonic energy from the acoustic wave transducers.

168. The method of claim 167, wherein an acoustic power level impinging on the wafer non-device side is between 0.01 W/cm2 and 10 W/cm2.

169. The method of claim 167, wherein the acoustic power level impinging on the wafer non-device side is between 0.1 W/cm2 and 5.0 W/cm2.

170. The method of claim 167, wherein the first chemical is deionized water.

171. The method of claim 167, wherein the first chemical is SC-1.

172. The method of claim 167, further comprising:

rotating the wafer on a bracket;

providing acoustic energy at a frequency greater than 700 kHz; and

flowing a second chemical onto a device side of the wafer.

173. The method of claim 167, wherein the first chemical is a mixture by volume of about; 1 part ammonia, 2 parts hydrogen peroxide, to 80 parts water where the ammonia is a solution of approximately 28% in water and the hydrogen peroxide is a solution of approximately 31% in water.

174. The method of claim 172, wherein the second fluid is water.

175. The method of claim 167, wherein the frequency is in the range of 1.5 – 2.0 MHz.

176. A wafer holding apparatus, comprising:

a bracket capable of rotating about an axis, having at least three points of contact with the wafer; wherein the wafer position is maintained onto the bracket by gravity.

177. The apparatus of claim 176, wherein the bracket is capable of translating along the axis.

178. The apparatus of claim 176, wherein the contact points are pads.

179. The apparatus of claim 178, wherein the pads are an elastomer.

180. The apparatus of claim 178, wherein the pads are positioned on a plurality of posts.

181. The apparatus of claim 65, wherein the posts are airfoil-shaped.

182. A method for positioning a wafer in a bracket, comprising:

placing a wafer into a rotatable wafer holding bracket;

positioning the wafer parallel to and aligned with a platter;

maintaining a wafer position, during low rotation speeds of the wafer holding bracket, with natural forces resulting from a fluid placed between the platter and the wafer.

183. The method of claim 182, wherein the natural forces are comprised of surface tension and capillary forces.

184. The method of claim 182, further comprising stabilization of the wafer holding bracket during rotation from vibration through the use of air-foil shaped posts.

185. The method of claim 182, wherein the wafer holding bracket exposes substantially all of a device side and a non-device side of the wafer to chemicals.

186. The method of claim 182, wherein maintaining a wafer position, during high rotation speeds of the wafer holding bracket, with natural forces resulting from the platter fixed in place a distance from the rotating wafer.

187. The method of claim 186, wherein the natural forces are Bernoulli forces caused by the different gas flow velocities above verses below the wafer.

188. The method of claim 182, wherein the method of maintaining position of the wafer further comprises a high airflow down onto the wafer from an air filter positioned above.

189. The method of claim 188, wherein the air filter is an HEPA filter.

190. The method of claim 188, wherein the air filter is an ULPA filter.

191. An apparatus for processing wafers, comprising:

a process chamber;

a plurality of wafers; and

a plurality of acoustic wave transducers wherein the plurality of acoustic wave transducers can transmit a plurality of frequencies to the plurality of wafers.

192. The apparatus of claim 191, wherein at least one of the plurality of frequencies is greater than 625 kHz.

193. The apparatus of claim 192, wherein at least one of the plurality of transducers is positioned at an angle to the remainder of the transducers.

194. The apparatus of claim 191, wherein two of the different frequencies generated are 300 kHz and 1.8 MHz.

195. The apparatus of claim 191, wherein the different frequencies generated are approximately between 1.5 – 2.0 MHz.

196. The apparatus of claim 191, wherein signals having different frequencies are superimposed and the superimposed signals are sent to all of the plurality of acoustic wave transducers.

197. A method for wet processing wafers, comprising:

positioning a plurality of wafers substantially parallel to each other in a processing chamber;

flowing a fluid into the processing chamber;

providing megasonic energy in a first direction to run substantially parallel to the plurality of wafers; and

providing acoustic energy in a second direction to run substantially parallel to the plurality of wafers, where the first direction is an acute angle to the second direction, and where the megasonic energy includes at least two frequencies.

198. The method of claim 197, further comprising varying a power level for at least one of the at least two frequencies.

199. The method of claim 197, wherein the megasonic energy power level impinging on the plurality of wafers is approximately between 0.01 W/cm2 and 1.00 W/cm2.

200. The method of claim 197 wherein the acoustic power level impinging on the plurality of wafers is approximately between 0.1 W/cm2 and 0.5 W/cm2.

201. The method of claim 198, wherein varying the power level includes varying the power to zero for at least one of the at least two frequencies.

202. An apparatus for wet processing wafers, comprising:

a process chamber, comprising:

a plurality of wafers, and

a process fluid;

means for providing megasonic energy to the plurality of wafers in a first direction,

means for providing megasonic energy to the plurality of wafers in a second direction that is an angle to the first direction, and

means for providing different frequencies within the megasonic energy.

203. The apparatus of claim 202, further comprising:

means for transmitting a plurality of frequency signals to a plurality of acoustic wave transducers providing the megasonic energy.

204. An apparatus for processing a wafer, comprising:

a plurality of quartz rods positioned over the wafer capable of transmitting megasonic energy at a plurality of frequencies;

a wafer holding bracket capable of positioning a wafer parallel to the plurality of quartz rods; and

a chemical source capable of flowing a chemical between the plurality of devices and the wafer.

205. The apparatus of claim 204, wherein the chemical source includes one or more nozzles capable of spraying the chemical onto the wafer.

206. A system for wet processing a wafer, comprising:

means for positioning and rotating the wafer in a process chamber;

a chemical source;

means for dispensing a first chemical onto a bottom side of the wafer;

means for dispensing a second chemical onto a topside of the wafer;

means to apply megasonic energy to the wafer; and

controlling electronics.

207. The system of claim 206, wherein the process chamber is capable of providing an air flow past an annular ring of vents so as to pull chemicals and gasses off the wafer.